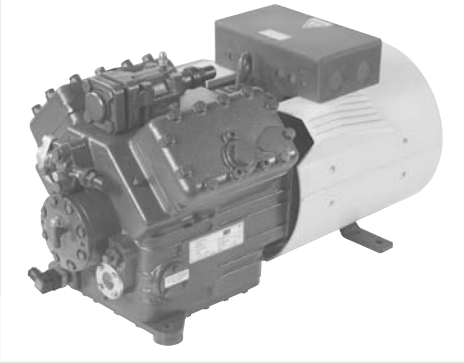
BOCK®
COMPRESSORS



HA5

Operating instructions

Types:

HA5/725-4
HA5/830-4
HA5/925-4

D
GB
F
E
I

Foreword

Dear Customer,

Bock compressors are top-quality, reliable, service-friendly quality products. Please comply with the following operating and maintenance instructions so that you can benefit from all advantages to the full and use your refrigerating system throughout its entire service life. If you have any questions about installation, operation and accessories, please contact our technical service or your refrigerating system wholesale dealer or our representative. The Bock service team is available by phone under **+49 7022 9454-0***, by e-mail under* **mail@bock.de** *or on the internet under* **www.bock.de***. In addition, for German speaking countries we have set up a toll-free hotline under* **00 800 / 800 000 88** *from Monday to Saturday between 8 a.m. and 9 p.m. Any suggestions you may have regarding the on-going development of our compressor, equipment and parts programme are welcome at any time.*

Please read the information summarised for you in this manual before starting work.

It contains important instructions for safety, installation, initial commisioning and handling. In addition you will find information on maintenance, spare parts and accessories.

Some instructions are identified by special symbols with the following meaning:

WARNING! This symbol is used to indicate that inaccurate compliance or total failure to comply with the instructions could cause injury to persons or damage to the comperssor or refrigerating machine.

DANGER! This symbol refers to instructions for avoiding direct serve dangers to persons.

DANGER! This symbol refers to instrucion for avoiding direct serve dangers to persons or plant by electrical current.

This symbol indicates important additional instructions which you should observe during your work.

The high quality standart of Bock compressors is guaranteed also by on-going furtherdevelopment of machine, features and accessories. This could possible results in non conformities between this present manual and your compressor. Please understand tha it is not possible for any claims to be derived from the details, illstrations and descriptions.

Your team at
Bock Kältemaschinen GmbH

- Subject to modification -

GB

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Safety instructions

The Bock refrigerating compressors named in the title are intended for installation in machines (within the EU according to EU directive 98/37/EC Machinery Directive, 97/23/EC Pressure Equipment Directive and 73/23/EC Low Voltage Directive). Initial commissioning is only allowed when the compressor has been installed according to these instructions and the whole machine in which it is integrated has been tested and accepted according to the statutory regulations.

Bock refrigerating compressors have been designed to state-of-the-art engineering. Safety for the user is given particular priority during the design stage. However, it is always possible for the refrigerating machine and operation thereof to pose unavoidable residual risks. **This is why these instructions must be observed carefully by every person working at the compressor.**

Work on the compressor may only be carried out by persons whose technical training, skills and experience together with their knowledge of pertinent regulations and documentation means that they are capable of assessing the work to be carried out and detecting any possible dangers.

Safety instructions

Note! Refrigeration compressors are machines loaded by pressure and require special caution and care in the handling.

- **Any handling of the compressor is permissible only by skilled personnel!**
- **Observe national safety regulations, accident prevention regulations, generally recognized technical rules as well as specific regulations (EN 378, EN 60204, EN 60335 etc.).**
- **Carry compressors only with hoists with sufficient lifting power.**
- **Operate compressors only in refrigeration plants with approved refrigerants.**
- **Do not exceed permissible operating pressure – even for testing purposes.**
- **Caution! Compressors are filled with protective gas ex works (approx. 3 bar nitrogen). Avoid possible injuries to skin and eyes! Wear goggles! Relieve pressure of compressors before connection to the refrigeration system!**
- **Before start-up check compressor for transport damage.**
- **Before start-up check that all components mounted by the user are installed correctly and connected pressure-tight with the compressor (pipes, plugs, union nuts, replaced components etc.).**
- **Before start-up evacuate the refrigeration plant with compressor carefully and then charge with refrigerant.**
- **Open discharge and suction shutoff valves before starting the compressor.**
- **Do not start the compressor in vacuum! Operate only with refrigerants charge.**
- **Corresponding to the conditions of use, surface temperatures of more than 100 °C on the discharge side and below 0 °C on the suction side can be reached.**

Product description

Use as intended

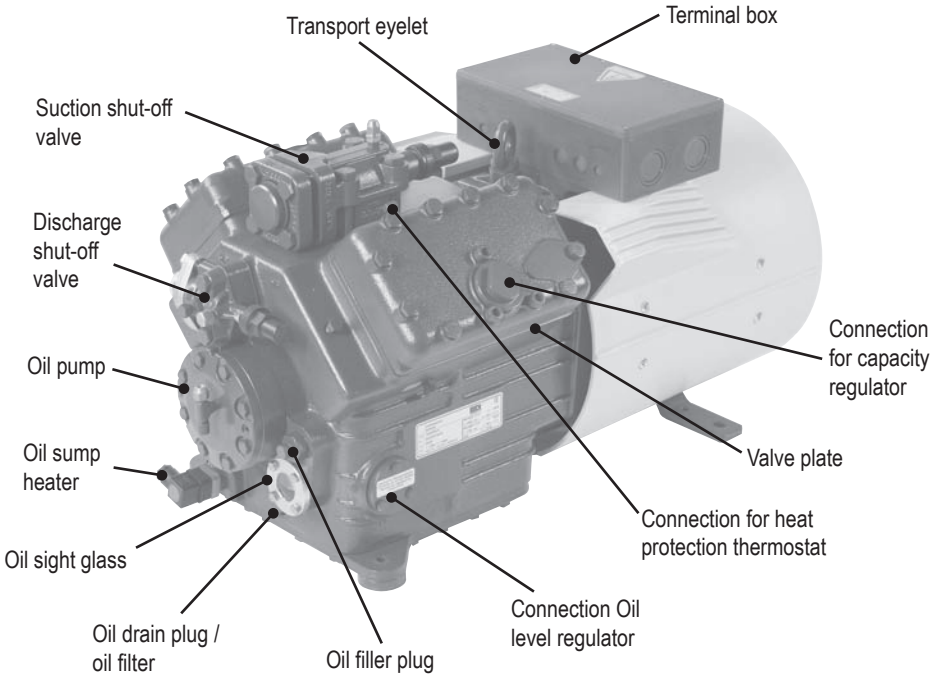
This operating manual describes the compressor named in the title in the standard version. Bock refrigerant compressors are intended for use in refrigeration plants using the refrigerants stated below and under compliance with the operating limits. **Any other use of the compressor is not permitted!**

WARNING! Do not use in explosion-risk environments!

Short description

- Semihermetic four-cylinder reciprocating compressor with air cooled drive motor
- Driving motor at the compressor stator flanged on.
- Particularly for the freezing with air-cooled engine and direct sucking in at the cylinder.

Main function parts



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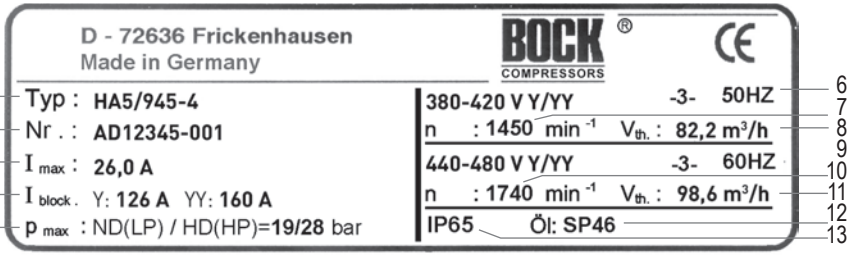
Product description

Name plate (example)



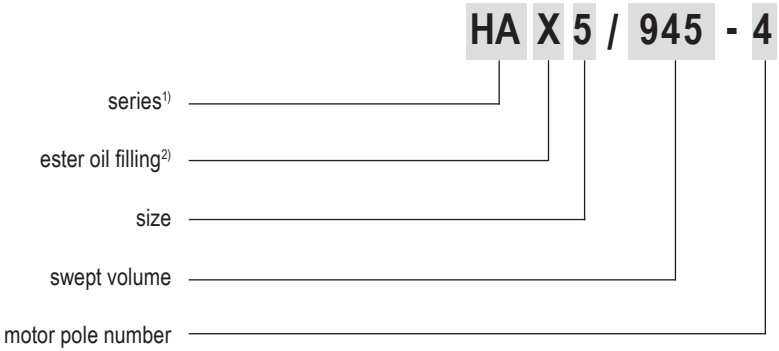
1	Type designation
2	Machine number
3	Maximum operating current
4	Start-up current (rotor blocked) Y: part winding 1 YY: part winding 1 and 2
5	ND (LP): max. admissible stop period pressure intake side ND (HP): max. admissible working pressure high pressure side

ⓘ **Note limits of application diagramms!**

6	Voltage, switching, frequency	
7	Rated speed	**50 Hz**
8	Theoretical volume flow rate	
9	Voltage, switching, frequency	
10	Rated speed	**60 Hz**
11	Theoretical volume flow rate	
12	Oil grade filled by the manufacturer	
13	Protection terminal box	

ⓘ **Electrical accessories can change the IP safety class system!**

Type code (example)



1) HA= Hermetic-Air-cooled for deep freezing

2) X= Ester oil filling (HFC refrigerant), e.g. R404A, R507

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Areas of Application

Refrigerant

- (H)FCKW / (H)CFC: R22
- HFKW / HFC: R404A/R507

Oil filling

- The compressors are filled with the following oil grades in the factory:
  - for R22 FUCHS Reniso SP 46
  - for R404A/R507 FUCHS Reniso Triton SE 55

- **We recommend the above oil grades for refilling. Alternatives: see the lubricant table page 22.**

Limits of application diagrams

- **It is possible to operate the compressor within the operating limits shown in the diagrams. Please note the significance of the shaded areas. Thresholds should not be selected as design or continuous operating points.**
  - **Max. permissible end temperature of the compressor: 140°C**
  - **Max. permissible switching frequency: 12x /h**
  - **A minimum running time of 3 min. steady-state condition (continuous operation) must be achieved.**

- **With enterprise with output regulator**
  - **in the frontier sometimes reduction and/or individual attitude of the suction gas overheating necessarily.**

- **For operation with frequency converter**
  - **Achieving the max. permissible power consumption of the drive motor can restrict the operating limits.**

- **During operation in the vacuum range, there is a danger of air entering on the suction side. This can cause chemical reactions, pressure rise in the conden ser and an excessive compressed-gas temperature. Avoid absolutely any entry of air.**

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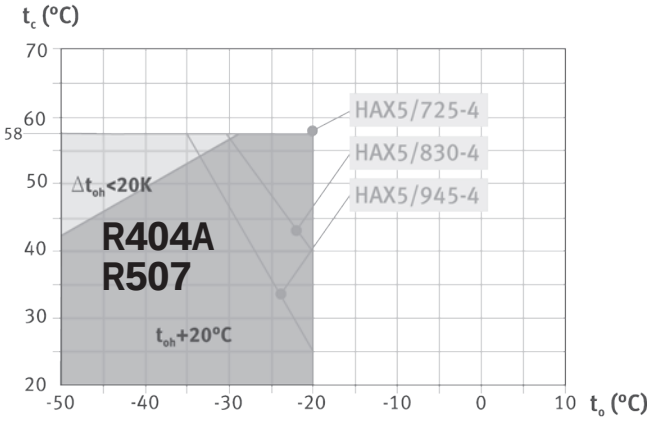
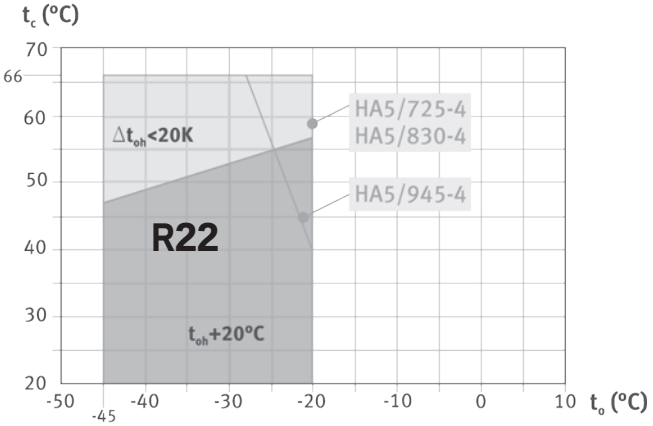
Areas of application





Unlimited application range

Reduced suction gas temperature

t_o evaporation temperature (°C)
t_c condensing temperature (°C)
Δt_{oh} suction gas overheating (K)
t_{oh} suction gas temperature (°C)

Design for other areas on request

Max. permissible operating pressure (HP): 28 bar

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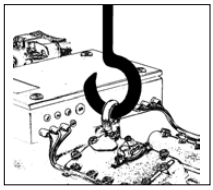
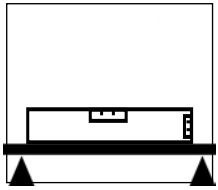
Installation

Warning! Compressors are filled with protective gas ex works (approx. 3 bar nitrogen!
- **Leave protective gas filling in the compressor up to evacuation.**
- **Do not open shutoff valves up to evacuation.**
- **Absolutely avoid entry of air!**

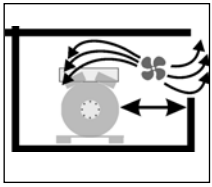
Erection



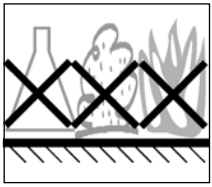
- Use transport eyelet.
- Do not lift manually!
- Use lifting gear!



- Erect on a flat surface or frame with sufficient load-bearing ability. Only erect on a slant in consultation with the manufacturer.
- Single compressor preferably on vibration damper.
- Duplex and compound connection basically rigid.



- Ensure there is sufficient space for maintenance work
- Ensure there is sufficient ventilation in the machine room.



- Do not operate in a corrosive atmosphere, dust, vapor or flammable environment.

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Pipe connections

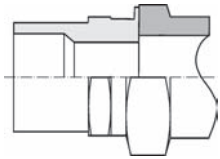


Fig.: schematic

- The **pressure and suction shutoff valves** have graduated inside diameters, so that pipes in the customary millimeter and inch dimensions can be used. The pipe will be immersed more or less deeply according to dimension.
- The connection diameters of the shutoff valves are designed for the maximum compressor output. **The actually required pipe cross-section must be adapted to the actually refrigeration capacity. The same applies for non-return**

Installation

Caution when soldering!

- Remove screw connections from the valve for soldering.
- Cool the valve body during and after soldering.
- Do not overheat the valve.

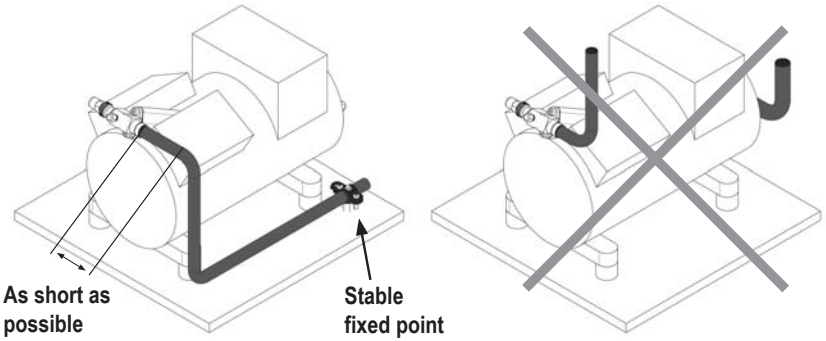
Pipes

- Pipes and system components must be clean and dry inside and free of scales, metal chippings, and coats of rust and phosphate. Only use hermetically sealed parts.
- Lay pipes correctly. Avoid strong vibrations because of the risk of cracks and breaks. Provide suitable fixed points and/or vibration compensators as required.
- Guarantee a correct oil return.
- Keep pressure losses to an absolute minimum.

A proper run of the suction and discharge line immediately after the compressor is of great importance for the system´s smooth running and freedom from vibration.

Improperly installed pipes can cause cracks and tears, which results in refrigerant loss.

A rule of thumb:
Always lay the first pipe section starting from the compressor downward and parallel to the drive shaft.



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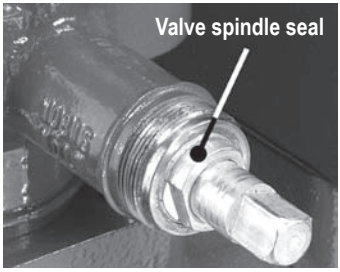
Installation

Shut- off valves

Attention! Comply with the safety instructions on page 9!

Before opening or closing the shut-off valve, turn the valve spindle seal approx. ¼ of a turn counter-clockwise. After activating the shut-off valve, tighten the valve spindle seal again clockwise.



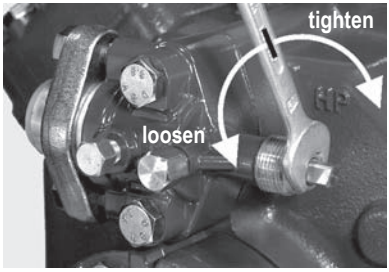
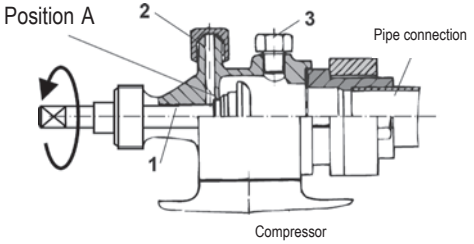


Fig. schematic

Mode of operation of the screw-down service connections

Opening the shutoff valve:
Turn the spindle to the left (counterclockwise) up to the stop.
Shufoff valve fully opened, service connection closed.



Opening the service connection:
Turn spindle 1/2 - 1 turn to the right.
Service connection opened, shutoff valve opened.

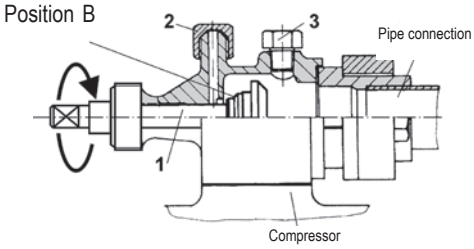


Fig. schematic

Connection 3 is intended for safeguard systems an cannot be shut-off.

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Electrical system

Electrical connection

Warning! High voltage! Perform work only with the electrical installation disconnected from the power supply!

- Make connection of the compressor motor according to the circuit diagram (see inside of terminal box). Comply with local safety regulations for electrical work and the safety standards EN 60204, EN 60335 when connecting.
- For cable lead-through at the terminal box use suitable cable screw connections in correct protective version (see name plate). Use strain relief. Avoid abrasion points on cables.
- **Motor contactors, feed lines and fuses are to be rated according to the maximum operating current (see compressor nameplate).**
- Compare the details for voltage and frequency on the nameplate with the details for the electricity mains supply. **The motor may only be connected up when these details correspond.**

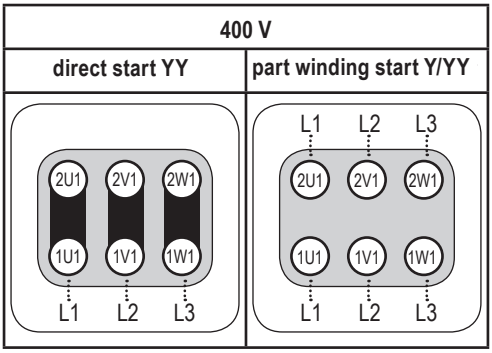
Standad motor, designed for direct or part winding start

Designation on the name plate	Designation on the terminal box
Y / YY	

Compressors marked in this way are suitable for direct or part winding start. The motor winding is divided into two parts: part winding 1 = 66% and part winding 2 = 33%. This winding devision reduces the start-up current during a part winding start to approx. 65% of the value for a direct start.

Mechanical start unloader with bypass solenoid is not required.

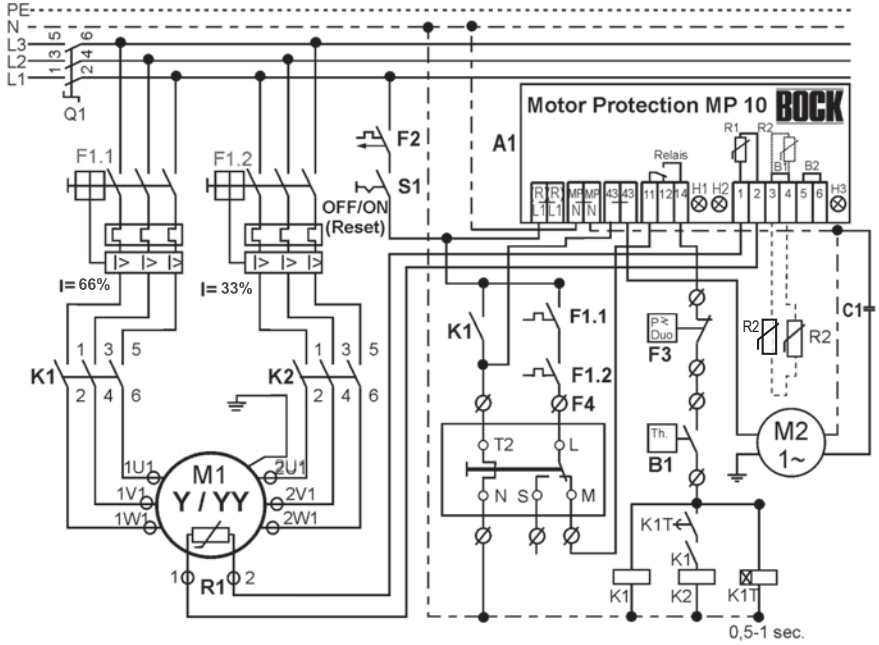
In the factory, the motor is switched for direct starting (YY). For part winding start (Y/YY), remove the bridges and connect the motor feed cable according to the circuit diagram.



Electrical system

WARNING!
Failure to comply results in reversed fields of rotation and can cause motor damage. After the motor has started up with part winding 1, part winding 2 must be switched on after max. 1 second delay. Failure to comply can be detrimental to the service life of the motor.

Main line wiring diagram for part winding start with standard motor



CAUTION!
Ensure that power is supplied via K1 to winding 1 (66%) (1U1 / 1V1 / 1W1) and via K2 to winding 2 (33%) (2U1 / 2V1 / 2W1). The motor contactors (K1/K2) are each to be rated for approx. 70% of the max. operating current.

1-2 Connections for PTC sensor
R1 PTC sensor motor winding
R2 Heat protection thermostat (PTC sensor)
F1 2 motor safety switches (66%:33% of I_A total
F2 Fuse control power circuit
F3 Safety chain (high/low pressure monitoring)
F4 Oil differential pressure controller
C1 Operating condenser fan
B1 Enabling switch (thermostat)
K1 Mains contactor (part winding 1)
K2 Mains contactor (part winding 2)
K1T Delay relay max. 1s
A1 Trigger unit MP10
Q1 Main switch
S1 Switch control voltage
M1 Compressor motor
M2 Ventilator motor

GB

Electrical system

Speciale Motor version for direct or star delta starting

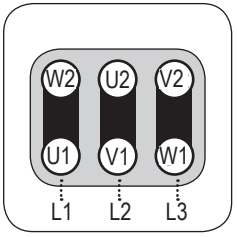
Mechanical start unloader with bypass solenoid (accessories) is requiered for star delta starting.

Designation on the nameplate	Designation on the yellow label on the terminal box
Δ / Y	

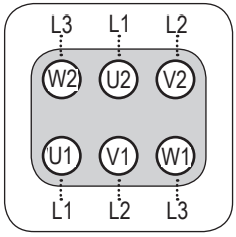
Compressors with this code are suitable in the voltage range Δ (230 V) for start delta starting. Example:

230 V Δ

direct start

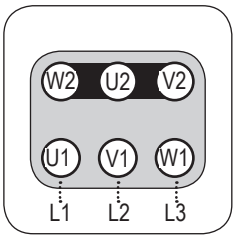


star delta start



400 V Y

only direct start



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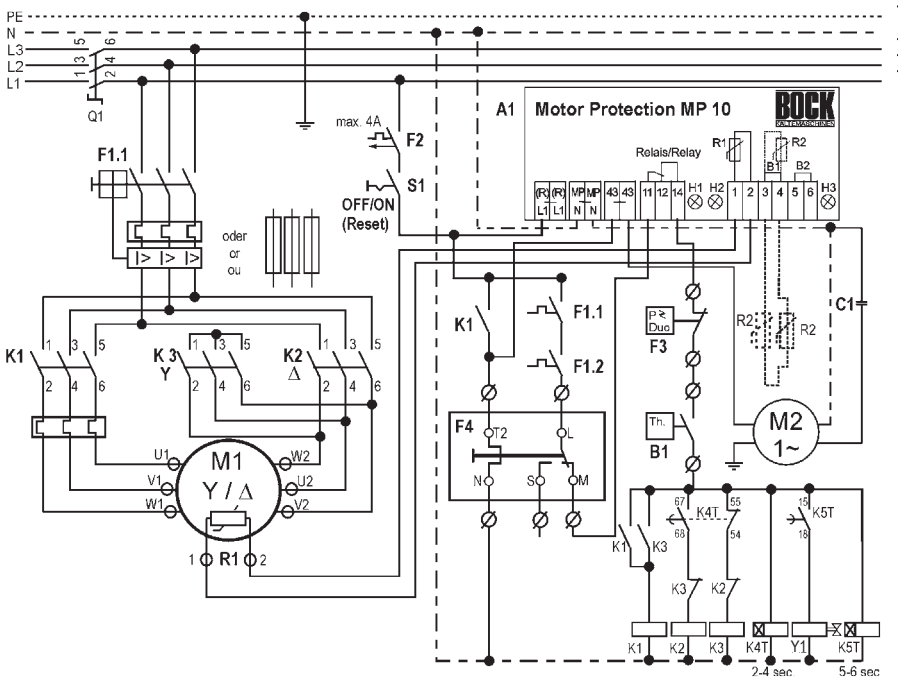
Electrical system

Maine line diagram for star delta starting with special motor



1-2 Connections for PTC sensor
R1 PTC sensor motor winding
R2 Heat protection thermostat (PTC sensor)
F1 Safety device load stabilisation circuit
F2 Fuse control power circuit
F3 Safety chain (high/low pressure monitoring)
F4 Oil diffenential pressure controller
B1 Enable switch (thermostat)
Q1 Main switch
C1 Operating condenser fan

M1 Compressor motor
M2 Ventilator motor
K1 Mains contactor
K2 Δ contactor
K3 Y-contactor
K4T Time relay for contactor changeover
K5T Time relay for start unloader
A1 Electronic trigger MP10
S1 Switch control voltage
Y1 MV- start unloader

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Electrical system

Electronic trigger MP 10

The compressor motor is equipped with posistor temperature sensors (PTC) which are wired to the electronic trigger MP 10 in the terminal box. The stand-by modecis indicated by the light diode H3 (green) when mains voltage is applied. In the event of overtemperature in the motor winding, the device switches the compressor off and signal lamp H1 lights up red.
In addition, the hot gas side of the compressor can be protected from overheating by a heat protection thermostat (accessories). The signal lamp H2 (red) is intended for this function.

When the device has triggered, this indicates an overload or intolerable operating conditions. Ascertain and eliminate de cause.

The device has a reclosure preventing feature. After eliminating the fault, the device is quit by interrupting the mains power with the external alarm reset switch S1 (see mainline wiring diagram). The reclosure preventing feature is unlocked and LEDs H1 or H2 go off again.

Connection of the electronic trigger MP 10

The electrical connection of MP 10 is to be completed according to circuit diagram.
The trigger is to be protected with a fuse (F) of max. 4 A, slow-acting. To guarantee the protection function, the electronic trigger is mounted as first element in the control power circuit.

Connections temperature monitoring:
- motor winding: terminals 1 - 2
- hot gas side: terminals 3 - 4

WARNING! Terminals 1 - 6 on the electronic trigger MP 10 and terminals PTC 1 and PTC 2 on the compressor terminal board may not come into contact with mains voltage. This would destroy the electronic trigger and the PTC sensors.

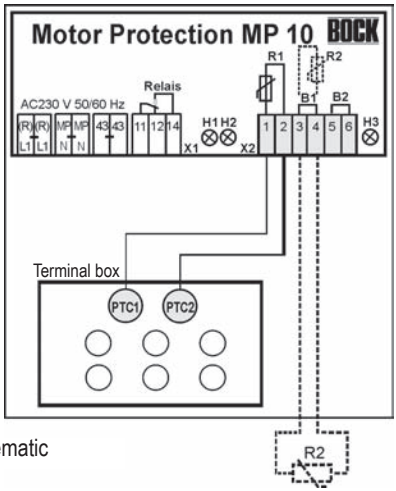


Fig. schematic

Electrical system

Function test of the electronic trigger MP 10

Before starting up and after any faults or changes to the control power circuit of the machine, check the electronic trigger to ensure that it functions properly:

Pos	Procedure	LED H1 red	LED H2 red	LED H3 green
1	● **Interrupt the power supply (L1 or S1)** ● Disconnect the motor temperature sensor connection (terminal 1 or 2) ● Disconnect the hot gas temperature sensor (if installed) (terminal 3 or 4)	**OFF**	**OFF**	**OFF**
2	● **Switch the power supply on again (L1 or S1).** ● Function check motor temperature sensor: stand-by ● Function check hot gas temperature sensor: stand-by	**ON**	**ON**	**ON**
3	● **Interrupt mains voltage again (L1 or S1)** ● Connect terminals 1 or 2 respectively 3 or 4 again	**OFF**	**OFF**	**OFF**
4	● **Switch the power supply on again (L1 or S1):** ● MP 10 in stand-by mode	**OFF**	**OFF**	**ON**

The compressor and the motor protection unit MP10 are ready for use if the LED control lamps signal perfect operating functions.

Information for contactor and motor contactor selection

All protection equipement switching and monitoring devices must comply with the local safety regulations and established specifications (e.g. VDE) and regulations as well as the manufacturer's specifications. **Use motor protector switch!** Motor contactors, feed lines and fuses are to be rated according to the maximm operating current (see name plate). A max. 7 times the permissible operating current according to the compressor name plate is set as short circuit triggering current.

Electrical system

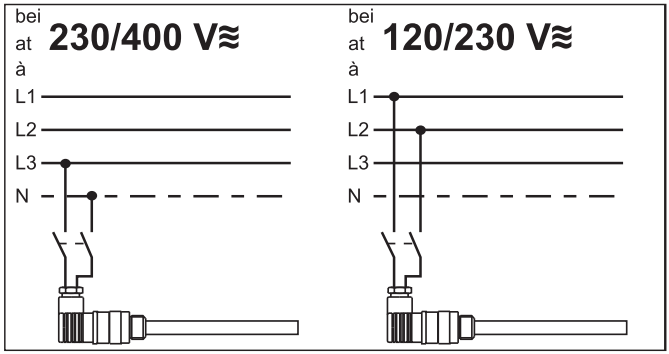
Oil sump heating

When the compressor is at a standstill, coolant diffuses into the lubricating oil of the compressor housing, depending on pressure and ambient temperature. This reduces the lubricating capacity of the oil. When the compressor starts up, the coolant contained in the oil evaporates out through the reduction in pressure. The consequences can be foaming and migration of the oil, causing oil shocks under certain circumstances.

In order to avoid damage to the compressor, the compressor is equipped with an oil sump heating as a standard feature. The oil sump heating should always be connected up and operated.

Operation: The oil sump heating operates when the compressor is at a standstill. When the compressor starts up, the oil sump heating switches off again automatically.

Connection: The oil sump heating must be connected via an auxiliary contact (or parallel wired auxiliary contact) of the compressor contactor to a separate electric circuit. El. data: 230 V - 1 - 50/60 Hz, 140 W



WARNING! The oil sump heating must not be connected to the electrical circuit of the safety control chain.

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Ventilator motor

The ventilator motor for cooling the compressor is already wired in the terminal box. Please consult the main-line wiring diagram in the terminal box for the power supply and triggering via the compressor contactor. The ventilator motor is protected by a pressure controller.
Electrical data: 230 V / 1 / 50...60 Hz, 140 W, 0,71 A, IP44

Start-up

Preparations for start-up

The compressor has undergone trials in the factory and all functions have been tested. There are therefore no special running-in instructions.

Check the compressor for any signs of transport damage!

To protect the compressor from intolerable operating conditions, high- and low-pressure pressostats are absolutely necessary.
Comply with the accident prevention regulations!

Pressure strength test

The compressor was tested in the factory for pressure strength. If the entire plant should be subjected in addition to a pressure strength test, then observe the following:

- Test the cold circuit according to EN 378-2 (or a corresponding safety standard).
- Perform the pressure strength test preferably with dry nitrogen.
- **Under no circumstances press off the compressor with air.**
- Do not mix any refrigerant with the testing medium, since otherwise shifting the ignition limit into the critical range is possible.

Danger! The maximum permissible operating pressure of the compressor may not be exceeded during the entire testing process (see name plate information)!

Tightness test

- Performe the tightness test of the refrigeration plant according to EN 378-2 (or a corresponding safety standard) without inclusion of the compressor (preferably dried with N_2).
- Do not add any refrigerant to the testing medium since otherwise shifting the ignition limit into the critical range is possible.

Evacuation

- Firstly evacuate the plant, then include the compressor in the evacuation process.
  - Pressure relieve the compressor.
  - Open suction and pressure shutoff valve.
  - Evacuate with the vacuum pump on the suction and high pressure side.
  - Vacuum < 1,5 mbar with shutoff pump.
  - Repeat the process serveral times if necessary.

WARNING! Do not start the compressor in vacuum. Apply no voltage - also not for test purpose (may be operated only with refrigerant).

In the vacuum the spark-over and creepage current distances of the terminal board connection bolts shorten, this can lead to winding and terminal board damage.

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Start up

Filling with refrigerant

Wear personal safety gear!

- Check that the compressor suction and discharge shutt-off valves are open.
- With the compressor switched off, fill the liquid refrigerant directly into the condenser or receiver, breaking the vacuum.
- If the refrigerant needs topping up after starting the compressor, it can be topped up in vapour from on the suction side, or, taking suitable precautions, also in liquid from at the inlet to the evaporator.

- **Avoid overfilling the machine with refrigerant.**
- **To avoid shifts in concentration, zeotropic refrigerant blends (e.g. R407C) must always only be filled into the refrigeranting system in liquid form.**
- **Warning! Do not fill liquid refrigerant in the suction shut-off valve on the compressor.**
- **Do not mix additives with the oil and refrigerant.**

Start-up

Warning! Both shut-off valves - the suction and the discharge shut-off valve - must be opened before starting the compressor!

- Check that the safety and protection devices (pressure switch, motor protection, electrical contact protection measures tec.) are all functioning.
- Switch the compressor on.
- Check the oil level in the compressor, It should be visible in the sight glass.

Caution! If larger quantities of oil have to be topped up, there is a risk of oil liquid shocks. In this case, the oil return has to be checked.

- On reaching equilibrium (constant operating conditions), check that the system maintains the permitted operating conditions.
- When the whole system is running perfectley, we recommend drawing up a final protocol stating all important data and measured values.

Liquid sluggings

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WARNING! Liquid slugging can cause damage to the compressor and leakage of refrigerant.

To avoid liquid slugging, the following points should be observed:

- The whole plant must be properly designed.
- All components must be rated to be compatible with each other with regard to output (particulary evaporator and expansion valve).
- Suction gas overheating at the compressor entrance should be **min. 7 - 10 K** (check setting of the expansion valve).
- The machine must reach a state of equilibrium.
- Particulary in critical systems (e.g. serveral evaporator points), measures are recommended such as replacement of liquid traps, solenoid in the liquid line etc.

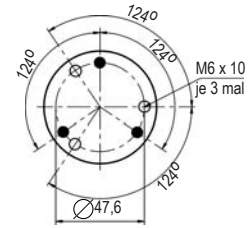
Refrigerant should not move in the compressor when the machine is at a standstill.

Start up

Connection of the oil level controller

Oil level controlling systems have proven useful in compound systems with serveral compressors. Connection O is provided for fitting an oil level controller (see dimensioned drawing). All customary oil level controllers make AC&R, ESK, CARLY and the electronic controller system OM3 TraxOil by Alco can be connected up directly without needing an adapter (see diagram). The oil level controller does not need a sight glass.

Mechanical oil level controller at connection „O“



● 3 hole connection diagramm for ESK, AC&R and CARLY
○ 3 hole diagramm for TraxOil

Maintenance

Safety instructions

Before starting any work on the compressor:
- **Switch the machine off an secure it against being switched back on.**
- **Relieve machine from the system pressure.**

After maintenance has been performed:
- **Connect safety switch.**
- **Evacuate compressor.**
- **Cancel switch-on blockage.**

Avoid entry of air into the plant!
Ester oil behaves very strongly hygroscopically. The humidity bonded in the oil cannot be removed sufficiently by the evacuation process. Therefore very careful handling is requiered!

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The compressor is to be kept in a clean, orderly condition by suitable care. In order to guarantee optimum operating safety and service life of the compressor, **we recommend** that you carry out the following servicing and checks at regular intervals:

- **Oil change** including cleaning the oil intake filter:
  - not mandatory in series machines produced in the factory
  - for field installation or operation in the application limit range, first oil change after approx. 100 - 200 operating hours, then approx. every years or 10,000 - 12,000 operating hours.
  - Dispose of used oil properly, comply with national regulations.
- **Regular checks:** Oil level, Tightness, running noise, pressures, temperatures, function of the additional equipment such as oil sump heater, pressure switches: annually. Observe national regulations.

Maintenance

Spare part recommendation

HA5	HA5/725-4	HA5/830-4	HA5/925-4
Designation	**Art.-No.**	**Art.-No.**	**Art.-No.**
Seal kit	08961		
Valve plate kit	08851		
Oil pump kit	08384		
Oil sump heater kit, 230 V ~	08426		
BS-AL/LR92 kit 220-240 V	08821		

Only use original Bock spare parts!

Accessories

Information to available accessories finds you in our product catalog as well as under www.bock.de.

Screwed unions

Various installation, maintenance and servicing work entails intervention in the compressor. **All work must therefore be performed with complianse with the given safety instructions. The screw starting torques are to be considered!**
Current table under www.bock.de.

Lubricants

The oil grade filled as standard in the factory is noted on the **name plate. This oil grade should be used preferabley.** Alternatives to this see following lubricant table.

Lubricants

Bock standard oil grade	Recommended alternatives	
For HFCKWs (e.g. R22)		
FUCHS Reniso SP 46	MOBIL SHC 425 SHELL Clavus SD 22-12 SUNOIL Suniso 3GS	SUNOIL Suniso 4GS TEXACO Capella WF 46
For HFCKWs (e.g. R404A)		
FUCHS Reniso Triton SE 55	FUCHS SEZ 32 ICI Emkarate RL 46 S	MOBIL Arctic AL 46 SHELL Clavus R 46

Information on further suitable oils on request.

Decommissioning

For major repairs or during shutdown: Observe safety instructions, p. 21

Close shut-off valves at the compressor. Suction off refrigerant (do not blow off!) and dispose of it according to regulations. Open screw connections or fl anges on the compressor valves and remove compressor, if necessary with lifting gear. Compressors and oil dispose correctly. Environmental regulations and national regulations consider!

Technical data

Type	Cylinders	Swept Volume 50 / 60 Hz (1450 / 1740 1/min)	Electrical Specifications ③				Weight	Connections ④		Oil filling	Sound pressure level
			Voltage ①	Operating current max. ② PW 1+2	Power consumption max. ②	Start Up current (rotor blocked) PW 1 / PW 1+2		Discharge valve DV	Suction valve SV		L / M ⑤
		m^3/h		A	kW	A	kg	mm (inch)	mm (inch)	Ltr.	dB(A)
HA5/725-4	4	62,9 / 75,5	380-420 V Y/YY - 3 - 50 Hz PW 440-480 V Y/YY - 3 - 60 Hz PW PW=Part Winding Winding ratios: 66%/33%	26	12,5	107 / 140	204	28 (1 1/8)	42 (1 5/8)	4,5	72 / 70
HA5/830-4		72,2 / 86,7		26	12,8	126 / 160	207				73 / 71
HA5/945-4		82,2 / 98,6		26	12,9	126 / 160	205				73 / 71

① Tolerance (± 10 %) applied to the average of the tension range. Other voltages and current types on request.

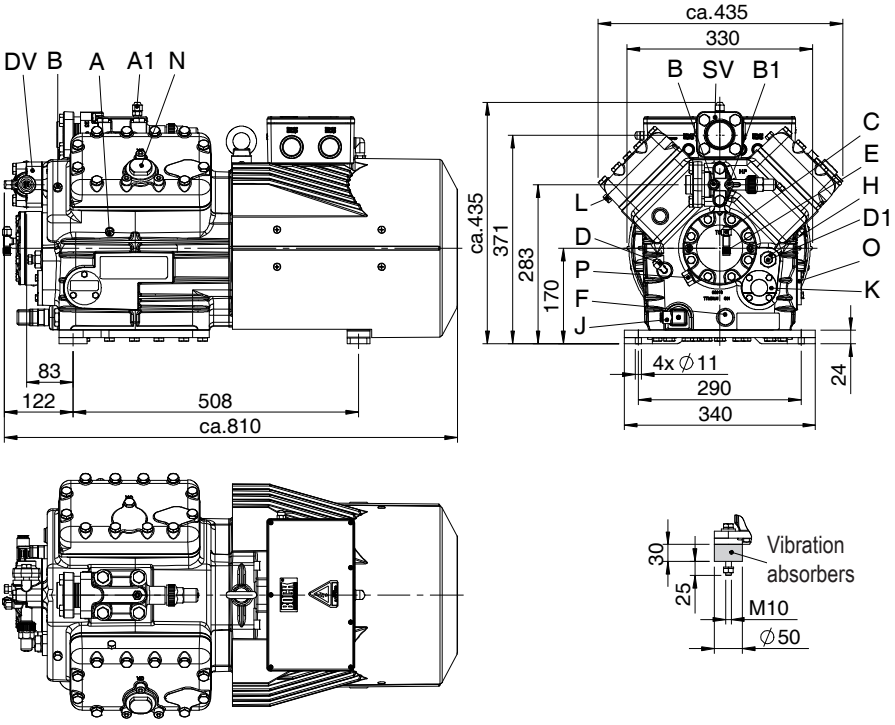
② Take account of the max. operating current / max. power consumption when designing contactors, leads and fuses. Switch: Service category AC3.

③ All data are based on the mean value of the voltage range.

④ For soldering joint

⑤ **L** = deep freezing range (-35 / 40°C), **M** = normal refrigerating range (-10 / 45°C), measuring conditions: low-reflection machine-room, measuring distance: 1m, Compressor operating at 50 Hz (1450 rpm), refrigerant R404A. The data are mean values, tolerance ± 2 dB(A).

Dimensions and connections



Dimensions in mm - Subject to change without notice.

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Dimensions and connections

SV **DV**	Suction line Discharge line Technical data, p. 23	
A	Suction side connection, not lockable	$^{1}/_{8}$“ NPTF
A1	Suction side connection, lockable	$^{7}/_{16}$“ UNF
B	Discharge side, not lockable	$^{1}/_{8}$“ NPTF
B1	Discharge side, lockable	$^{7}/_{16}$“ UNF
C	Oil pressure safety switch connection OIL	$^{7}/_{16}$“ UNF
D	Oil pressure safety switch connection LP	$^{7}/_{16}$“ UNF
D1	Oil return from oil seperator	$^{1}/_{4}$“ NPTF
E	Oil pressure gauge connection	$^{7}/_{16}$“ UNF
F	Oil drain	M22 x 1,5
H	Oil filling bung	M22 x 1,5
J	Oil sump heater	M22 x 1,5
K	Sight glass	4 hole M6
L	Heat protection thermostat	$^{1}/_{8}$“ NPTF
N	Capacity regulator	M45 x 1,5
O	Oil level controller	3 x M6
P	Oil differential pressure sensor	M20 x 1,5

Conformity and manufacturer's declaration

DECLARATION OF CONFORMITY CE 96
for use of the compressors within the European Union
(as per EU low voltage directive 73/23/EEC, in the version 93/68/EEC)

We herewith declare that the refrigerating compressors named in the title comply with the low voltage directive 73/23/EEC in the version 93/68/EEC.

Applied harmonised standard

EN 60335-2-34

When installing our products in a machine,
the following manufacturer declaration must be taken into consideration.

MANUFACTURER DECLARATION
for use of the compressors within the European Union
(refering to the EU machinery directive 98/37/EEC, annex II B)

We herewith declare that the refrigerating compressors named in the title in the version supplied by us are intended for installation in a machine which complies with the machinery directive 98/37/EEC.

Applied harmonised standards

EN ISO 12100-1	EN 349	EN 60529
EN ISO 12100-2	EN 60204-1	

It is however not permitted to start up our products before the machine in which they are integrated has been tested according to the corresponding statutory regulations and declared to be conforming in all points.

GB

Frickenhausen, 17.05.2004

Dr. Harald Kaiser
Technical Director

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COMPRESSORS

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QUALITY SYSTEM
certified by DQS according to
DIN EN ISO 9001 Reg. No. 2177

CERTIFIED IQNet MANAGEMENT SYSTEM